

Appl. No. : 10/663,318
Filed : September 16, 2003

REMARKS

Rejections Under 35 U.S.C. §102(e)

The Examiner has rejected Claims 1-2, 5-6 and 11-13 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,465,376 to Uzoh et al.

Applicants initially note that the Uzoh et al. does not constitute prior art under 35 U.S.C. §102(b) and reserve the right to swear behind the reference under 37 CFR §1.131.

Applicants have amended Claim 1 to recite “removing the conductive material with small grains faster than the conductive material with large grains.” The amendment is supported, for example, at paragraph nos. 38-39 of the publication of the present application, U.S. Publication No. 2004/0052930 A1 (application as filed at pp. 14-15).

As described at paragraph 41 (application as filed at p. 16, first full paragraph), “[t]hrough the use of etching, electroetching, or a properly selected CMP step, as described, on the grain structure represented in FIG. 4, the small grain Cu over the field regions 58 can be removed more quickly than the large grain Cu in and over the features 56, and the structure shown in FIG. 8, without dishing or copper remnants, can be obtained.” Furthermore, the application clearly describes that if CMP is chosen as the method for removal, not any CMP process will do. Rather, the application explains that “[i]n a CMP material process, if the mechanical component of the process is doing most of the material removal, then small grain regions of material can actually have a lower removal rate than that of the large grain regions” Paragraph 40 (application as filed at pp. 15-16).

The asserted Uzoh et al. reference, in contrast to the present application, actually prefers a more mechanical-dominated CMP process. “The CMP typically employs a relatively hard polishing pad and polished slurry having minimal copper removal rate relative to the grain boundary-filling method” Uzoh et al. at column 3, lines 57-59 (emphasis added). Thus, to the extent Uzoh et al. even have small grains over field regions and large grains in the features (which Applicants do not admit), Uzoh et al. still do not meet the claims because Uzoh et al. fail to teach removing small grains over the field regions faster than large grains over and in the features, as recited in amended Claim 1. Furthermore, Uzoh et al. actually teaches away from a process that could accomplish such relatively more rapid removal in the field regions, since the hard pad and minimal copper removal rate would more rapidly remove large grains.

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Note that, while Uzoh et al. does claim to minimize dishing or erosion of existing copper interconnect, it does so by a fundamentally different mechanism than that recited in the present claims. While the present invention relies on differential removal rates caused by differential grain sizes, Uzoh et al. relies instead upon intentionally inducing grooves due to granulation and then filling those grooves with a harder barrier material.

Accordingly, Applicants submit that Uzoh et al. fails to teach each and every feature of amended independent Claim 1. As Claims 2, 5-6 and 11-13 depend from independent Claim 1, and recite further distinguishing features of particular utility, Applicants respectfully submit that Uzoh et al. fails to anticipate these claims as well.

Rejections Under 35 U.S.C. §103

The Examiner has rejected Claims 3-7 and 7-10 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,465,376 to Uzoh et al. in view of U.S. Patent No. 6,380,083 to Gross.

Without admission as to the propriety of the combination, Applicants submit that the rejections are moot in view of the distinctions discussed above with respect to Uzoh et al. Gross fails to teach faster removal of small grains over the field regions as compared to large grains over and within the features and therefore fails to provide the teachings deficient in Uzoh et al., much less overcoming the teachings away in Uzoh et al.

Accordingly, Applicants respectfully submit that the rejections for obviousness are overcome.

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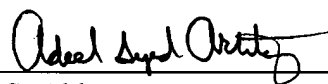
CONCLUSIONS

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance and request the same. If, however, some issue remains that the Examiner feels can be addressed by Examiner amendment, the Examiner is cordially invited to call the undersigned for authorization.

Respectfully submitted,

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